Math 150 **Sample Exam Questions** **Au 2000**

Final Exam

Part I

1. Let $g(x) = 2x - 3$ and $f(x) = x^2 + 4$.

a) Find the domain of $\dfrac{f(x)}{g(x)}$.

b) Find $f(4) - g(4)$.

c) Find a formula for $(f \circ g)(x)$.

d) Find all x for which $f(x) + g(x) = 0$

2. Find all real numbers x which satisfy the inequality: $x^2 + 3x > 10$.

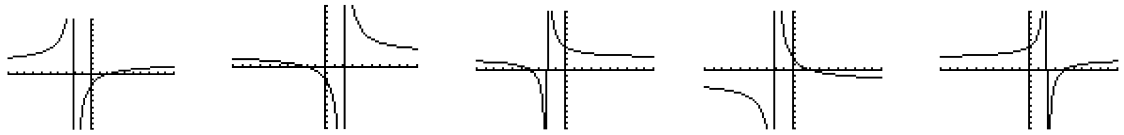
3. Factor the polynomial $f(x) = x^3 - 13x + 12$ into a product of three **linear** factors. (Hint: 3 is a zero.) Work must be shown. Calculator answers will not receive full credit.

4. Consider the function $f(x) = \dfrac{4(x-5)(x+3)}{(x+2)(x-3)}$. You must do parts a), b), and c) algebraically.

a) Find the vertical asymptotes.
b) Find the horizontal asymptotes, if any.
c) Find the x-intercepts and y-intercepts for the graph.
d) Sketch the graph. Be sure to include and label all of the information found above.

5. Under each graph picture write the letter of the appropriate description. There is only one correct description for each picture.

A. Horizontal asymptote at $f(x) = 2$; Vertical asymptote at $x = 2$; $f(x)$ is decreasing
B. Horizontal asymptote at $f(x) = 2$; Vertical asymptote at $x = -2$; $f(2) = 0$
C. Horizontal asymptote at $f(x) = -2$; Vertical asymptote at $x = 2$; When $x > 2$, $y > 0$.
D. Horizontal asymptote at $f(x) = -2$; Vertical asymptote at $x = -2$; When $x < -2$, $y < 0$.
E. Horizontal asymptote at $f(x) = 2$; Vertical asymptote at $x = 2$; $f(x)$ is increasing
F. Horizontal asymptote at $f(x) = 2$; Vertical asymptote at $x = -2$; $f(0) = 4$



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Part II

6. Solve the equation $1-\log(x+3)=\log(x)$ by finding the exact solution(s) using **algebraic methods**. **(Calculator solutions receive no credit.)**

7. a) Sketch the graph $f(x)=2\ln x+2$. Be sure to label all the intercepts and asymptotes if any.
b) Find the formula for the inverse function f^{-1}.

8. A certain angle φ has $\cos(\varphi) = -.2121$ and $\sin(\varphi) < 0$.
a) If φ is in standard position, which Quadrant contains the terminal side of angle φ?
b) Find all the possible values, in radians, for φ. (Hint: Your answer should include an integer k.)

9. Algebraically verify the identity.

$$1-\sin y=\frac{\cos^2 y}{1+\sin y}$$

10. Let $y=A\sin(Bx+C)$, where A, B, and C are positive. Given the following information, find A, B, and C, and write out the correct expression for y.

- Amplitude: 3
- Period: $\frac{p}{2}$
- Phase Shift: -1

Part III

11. Suppose that α, β are acute angles with $\cos(a)=\frac{3}{4}$ and $\sin(b)=\frac{2}{5}$.
Determine the **exact** value for $\cos(a+b)$.

12. a) Use the sum identities to algebraically verify this identity:

$$\sin 2x = 2\sin x\cos x$$

b) Let q be an acute angle and $\tan q=\frac{1}{4}$. Find the exact value of $\sin(2q)$. Calculator answers receive no credit.

13. Which angles q, in the interval $[0°, 360°)$, satisfy $\cos(2q)=\frac{1}{2}$? Find the **exact** values, in degrees, of all four answers.

14. Given that x is in the interval $[0, 2p)$, use algebraic methods solve the trigonometric equation $\tan x = 2\sin x$. **Exact** answers are required.

15. a) Convert the polar coordinates point $\left(7,\frac{2p}{3}\right)$ to rectangular coordinates. (Answer should be accurate to 2 decimal places.)
b) Change the polar equation $r=-2\sin q$ to rectangular form.
c) Change $y=x^2$ to polar form.